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ELECTRONICS

Approval

LEAD-FREE

TO   :   NEC

DATE   :   July. 15. 2011

SAMSUNG TFT-LCD

MODEL NO : LTN156AT26-N01

NOTE : Extension code [N]
                    → LTN156AT26-**N**
       Surface type [**Glare**]

The information described in this SPEC is approved and can not be changed without prior notice.

APPROVED BY :   *S.S.Seomun*

PREPARED BY : **Application Engineering Group, LCD sales & marketing Team**

SAMSUNG ELECTRONICS CO., LTD.

wise view™

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REVISION HISTORY

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Date	Revision No.	Page	Summary
Feb. 19. 2011	P00	All	The preliminary specification of LTN156AT26-N01 was issued first.
Mar. 24. 2011	P01	Page. 11	Current of Product is added
Apr. 04. 2011	P02	Page. 13	LED Driver IC spec is updated
Apr. 19. 2011	P03	Page 26, 27	Packing Spec is updated
May. 23. 2011	P04	Page. 8 Page. 6 Page. 27 Page. 11 Page. 15 Page. 22	- Luminance Min Value is added - Altitude (operation) is changed to 15,000 - Packing Spec is updated - Note for product electrical spec is changed - Pin description for Pin1, 5 are modified - Power Sequence T4 Remarks on Table is modified
Jun. 08. 2011	P05	Page 11,12 Page 8 Page 26	- Power Pattern word matching is finished - Contrast Ratio is changed - Information of Silica-gel is added
Jun. 13. 2011	P06	Page 13	- LED PWM Duty Ratio Min Value is changed (1% → 6%) - LED Input Voltage Min Value is changed (4.5V → 7.0V)
Jun. 15. 2011	P07	Page 24	- Comment about 'Symmetry' is added on 2D drawing
Jun. 15. 2011	A00	All	-The Approval specification of LTN156AT26-N01 is issued.
Jul. 15. 2011	A01	Page 25	- 2D drawing(Front Page) Label direction is changed

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REVISION HISTORY

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GENERAL DESCRIPTION

DESCRIPTION

LTN156AT26 is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as switcheing devices. This model is composed of a TFT LCD panel, a driver circuit and a backlight system. The resolution of a 15.6" contains 1366 x 768 pixels and can display up to 262,144 colors. 6 O'clock direction is the Optimum viewing angle.

FEATURES

- • Thin and light weight
- • High contrast ratio, high aperture structure
- • 1366 x 768 pixels resolution (16:9)
- • Fast Response Time
- • Low power consumption
- • LED BLU Structure
- • DE (Data enable) only mode
- • 3.3V LVDS Interface
- • On board EDID chip
- • Pb-free product
- • RoHS comply product
- • Flicker should be optimized with 2 by 1 half gray green pattern before shipping MP.

APPLICATIONS

- • Notebook PC
- • If the usage of this product is not for PC application, but for others, please contact SEC

GENERAL INFORMATION

Item	Specification	Unit	Note
Display area	344.232 (H) x 193.536 (V) (15.6"diagonal)	mm	
Driver element	a-Si TFT active matrix		
Display colors	262,144		
Number of pixel	1366 x 768	pixel	16 : 9
Pixel arrangement	RGB vertical stripe		
Pixel pitch	0.252 (H) x 0.252 (V) (TYP.)	mm	
Display Mode	Normally white		
Surface treatment	Haze 0, Hardness 3H (Reflection ratio 4~5%)		Glare

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Mechanical Information

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Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	358.8	359.3	359.8	mm	
	Vertical (V)	209.0	209.5	210.0	mm	
	Depth (D)	-	-	5.65	mm	(1)
Weight		-	450	490	g	

Note (1) Measurement condition of outline dimension
. Equipment : Vernier Calipers
. Push Force : 750g ·f (minimum)

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Storage temperate	T_{STG}	-20	60	°C	(1)
Operating temperate (Temperature of glass surface)	T_{OPR}	0	45	°C	(1)
Shock (non-operating)	Snop	-	210	G	(2),(5)
			50		(3),(5)
Vibration (non-operating)	Vnop	-	2.41	G	(4),(5)
Altitude (operation)	-	-	15,000	feet	
Altitude (storage)	-	-	40,000	feet	

Note (1) Temperature and relative humidity range are shown in the figure below.
 95 % RH Max. (40 °C > Ta)
  Maximum wet - bulb temperature at 39 °C or less. (Ta ≥ 40 °C) No condensation.
 (2) 2ms, half sine wave, one time for ±X,±Y,±Z.
 (3) 11ms, Trapezoidal wave, one time for ±X,±Y,±Z.
 (4) 5~500 Hz, Random vibration, 30 min for X,Y,Z.
 (5) At testing Vibration and Shock, the fixture in holding the Module to be tested have to be
  hard and rigid enough so that the Module would not be twisted or bent by the fixture.

Relative Humidity (%RH)
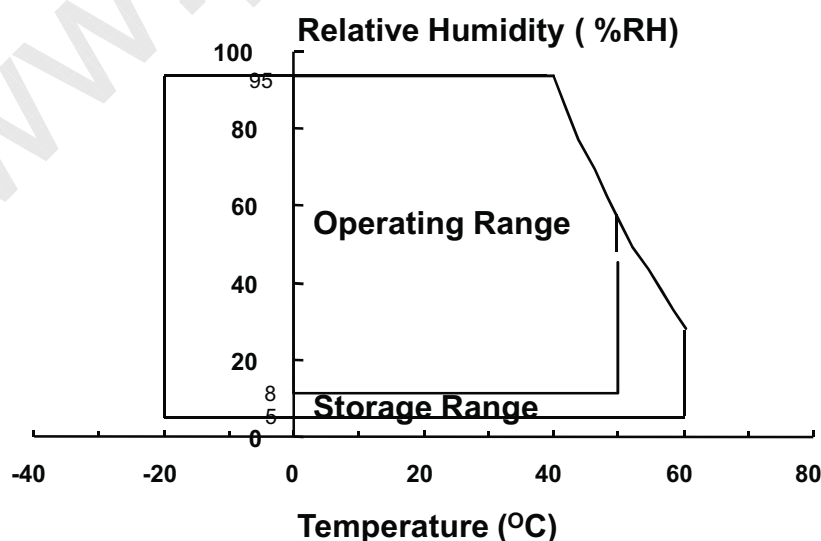
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1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD MODULE

V_{DD} =3.3V, V_{SS} = GND = 0V

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	$V_{DD} - 0.3$	$V_{DD} + 0.3$	V	(1)
Logic Input Voltage	V_{DD}	$V_{DD} - 0.3$	$V_{DD} + 0.3$	V	(1)

Note (1) Within Ta (25 ± 2 °C)

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2. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (5). Measuring equipment ： TOPCON SR-3
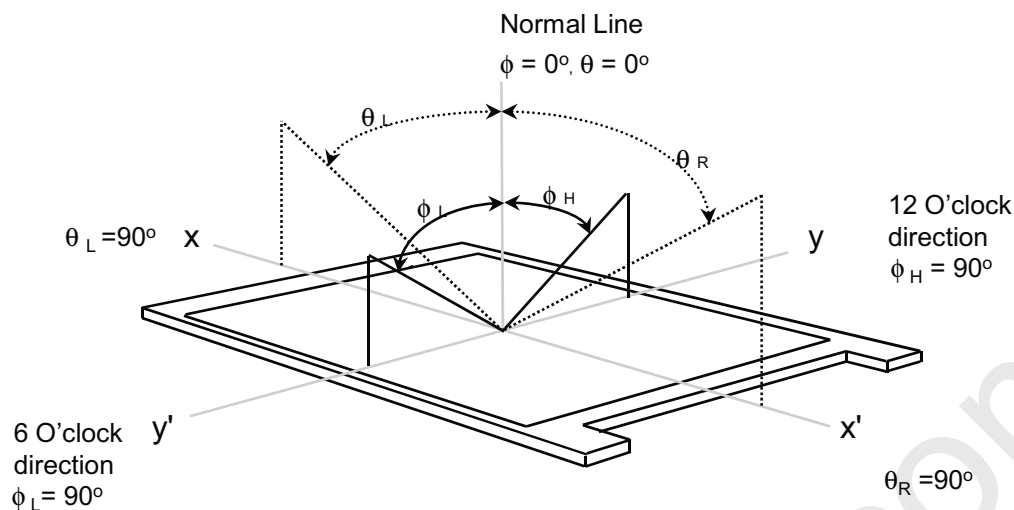
* Ta = 25 ± 2 ℃, V_{DD}=3.3V,   fv= 60Hz, fDCLK = **72.33** MHz, PWM duty = 100%

Item		Symbol	Condition	Min.	Typ.	Max	Unit	Note
Contrast Ratio		CR	1center point	500	600	-	-	(1), (2), (5)
Response Time at Ta (Rising + Falling)		$T_R + T_F$		-	16 (6+10)	25	msec	(1), (3)
Average Luminance of White		$Y_{L,AVE}$	1center point	472.5	500	-	cd/m^2	PWM duty = 100% (4)
Color Chromaticity (CIE 1931)	Red	R_X	Normal Viewing Angle $\phi = 0$ $\theta = 0$	0.585	0.615	0.645	-	(1), (5) SR-3
		R_Y		0.325	0.355	0.385		
	Green	G_X		0.300	0.330	0.360		
		G_Y		0.580	0.610	0.640		
	Blue	B_X		0.120	0.150	0.180		
		B_Y		0.070	0.100	0.130		
	White	W_X		0.283	0.313	0.343		
		W_Y		0.299	0.329	0.359		
Viewing Angle	Hor.	θ_L	CR ≥ 10	40	45	-	Degrees	(1), (5)
		θ_R		40	45	-		
	Ver.	ϕ_H		10	15	-		
		ϕ_L		30	35	-		
Color Gamut				-	60	-	%	
13 Points White Variation		δ_L		-	-	1.7	-	(6)

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Note 1) Definition of Viewing Angle : Viewing angle range(10 ≤ C/R)

Normal Line
$\phi = 0°, \theta = 0°$

θ_L

θ_R

ϕ_L ϕ_H

$\theta_L = 90°$ x

12 O'clock direction
$\phi_H = 90°$

y

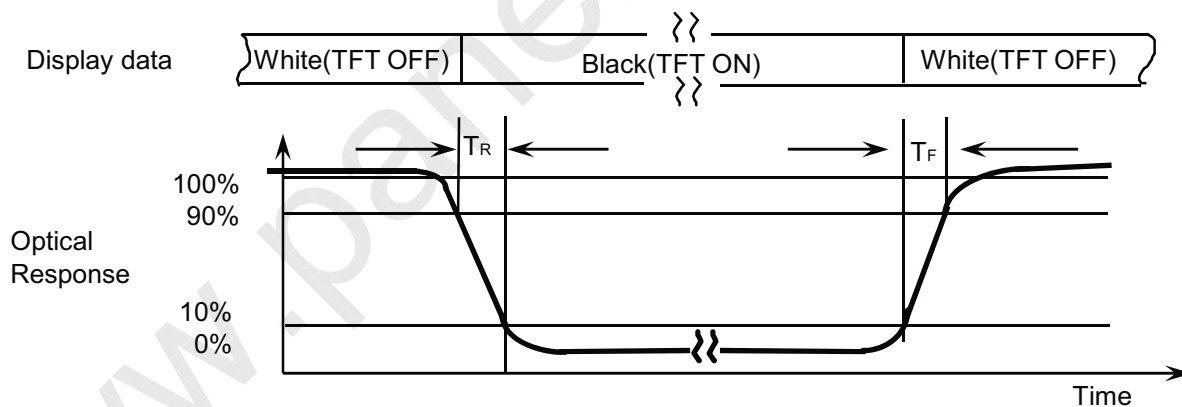6 O'clock direction
$\phi_L = 90°$

y'

x'

$\theta_R = 90°$

Note 2) Definition of Contrast Ratio (CR) : Ratio of gray max (Gmax) ,gray min (Gmin) at center 1point
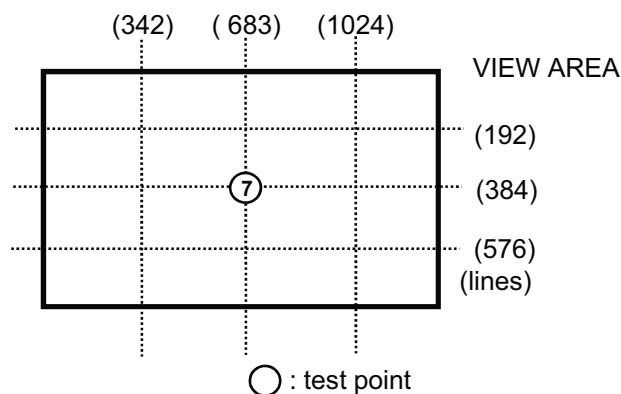
$$CR = CR (7)$$

Points : ⑦ at the figure of Note (6).

Note 3) Definition of Response time :

Display data | White(TFT OFF) | Black(TFT ON) | White(TFT OFF)

T_R T_F

100%
90%

Optical Response

10%
0%

Time

Note 4) Definition of Average Luminance of White : measure the luminance of white at center 1 point.

. Center 1 point of White ($Y_{L,AVE}$)

$$Y_{CENTER} = Y_{L7}$$

(342)   (683)   (1024)

VIEW AREA

(192)

⑦   (384)

(576)
(lines)

⑦ : test point

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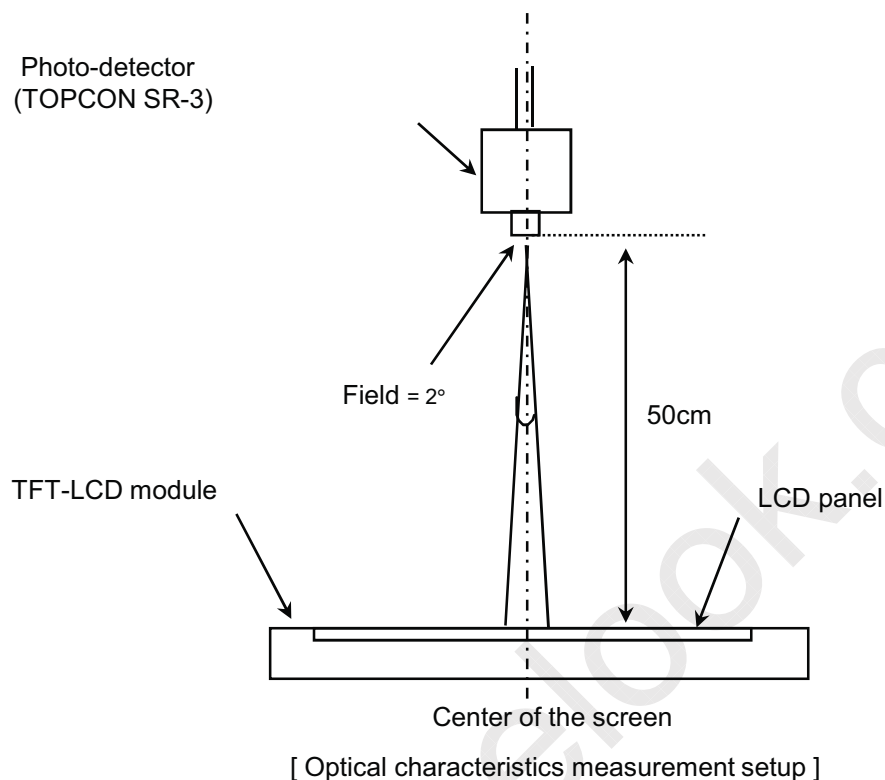| Doc.No.	LTN156AT26-N01	Rev.No	04-A01-S-110715	Page	9 / 34

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Note 5) After stabilizing and leaVBLg the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless,and dark room. 30 min after lighting the backlight. This should be measured in the center of screen.
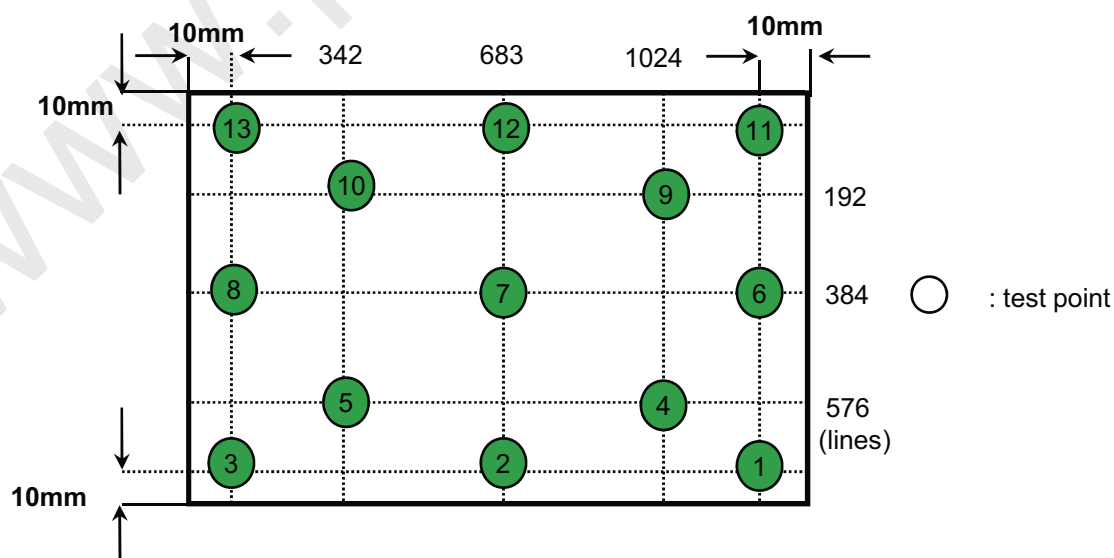LED current : TBD mA
Environment condition : Ta = 25 ± 2 °C

Photo-detector
(TOPCON SR-3)

Field = 2°

50cm

TFT-LCD module

LCD panel

Center of the screen

[Optical characteristics measurement setup]

Note 6) Definition of 13 points white variation (δ L), [① ~ ⑬]

$$\delta_L = \frac{\text{Maximum luminance of 13 points}}{\text{Minimum luminance of 13 points}}$$

10mm   342   683   1024   10mm

10mm

⑬   ⑫   ⑪

⑩   ⑨   192

⑧   ⑦   ⑥   384   ◯ : test point

⑤   ④   576 (lines)

③   ②   ①

10mm

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3. ELECTRICAL CHARACTERISTICS

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3.1 TFT LCD MODULE

Ta= 25 ± 2℃

| Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply		V_{DD}	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	High	V_{IH}	-	-	+100	mV	V_{CM} = +1.2V (+/- 10%)
	Low	V_{IL}	-100	-	-	mV	
Vsync Frequency		fv	-	60	-	Hz	
Main Frequency		f_{DCLK}	-	72.33	-	MHz	
EDID Input Voltage		V_{EDID}	1.8	3.3	5.5	V	
EDID Input Current		I_{EDID}	-	0.8	1.0	mA	V_{EDID}=1.8V, f_c=400kHZ
Skew		RSKM	-500	-	+500	ps	f_{DCLK} =72.33Mhz
Rush Current		I_{RUSH}	-	-	1.5	A	(5)
Current of Power Supply	White		-	240	-	mA	(2),(3)*a
	Mosaic		-	240	-	mA	(2),(3)*b
	V. Stripe	I_{DD}	-	380	-	mA	(2),(3)*c
	Black		-	240	-	mA	(2),(3)*d
	1 dot		-	400	450	mA	(2),(3),(4)*e

Note (1) Display data pins and timing signal pins should be connected.(GND = 0V)

(2) fv = 60Hz, f_{DCLK} = 72.33 MHZ, V_{DD} = 3.3V , DC Current.

(3) Max. 450mA is fixed with the margin from the maximum current in the SEC's test by even.

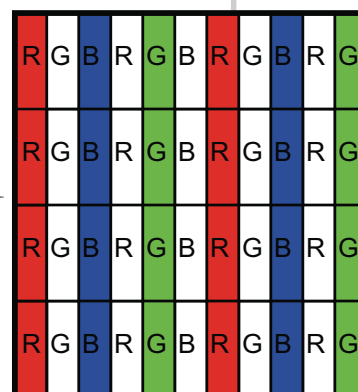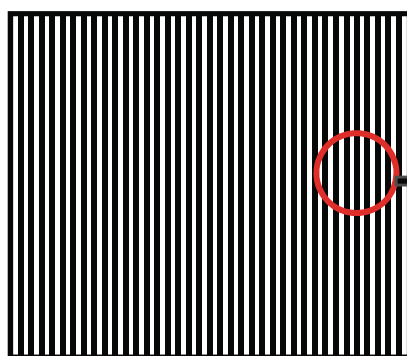(4) Power dissipation pattern

*a) White Pattern

VIEW AREA

*b) Mosaic Pattern

Display Brightest Gray Level

Display Darkest Gray Level
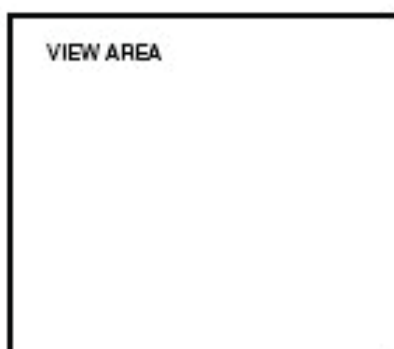
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*c) Vertical stripe pattern

*d) Black

*e) Max pattern : 1dot

5) Rush current measurement condition

3.3V

M1
2SK1059

V$_{DD}$ (LCD INPUT)

FUSE

C1
1uF

R1
47K

CONTROL SIGNAL
(HIGH to LOW)

R2
1K

M2
2SK1399

V$_{DD}$ rising time is 470us

12V

R3
47K
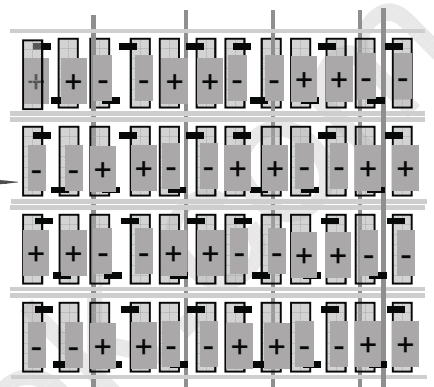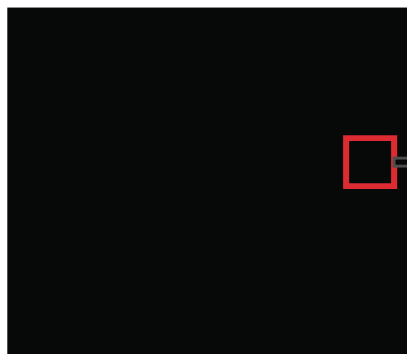
C2
10000pF

C3
1uF

GND

0.9V$_{DD}$

3.3V

0.1V$_{DD}$

470us
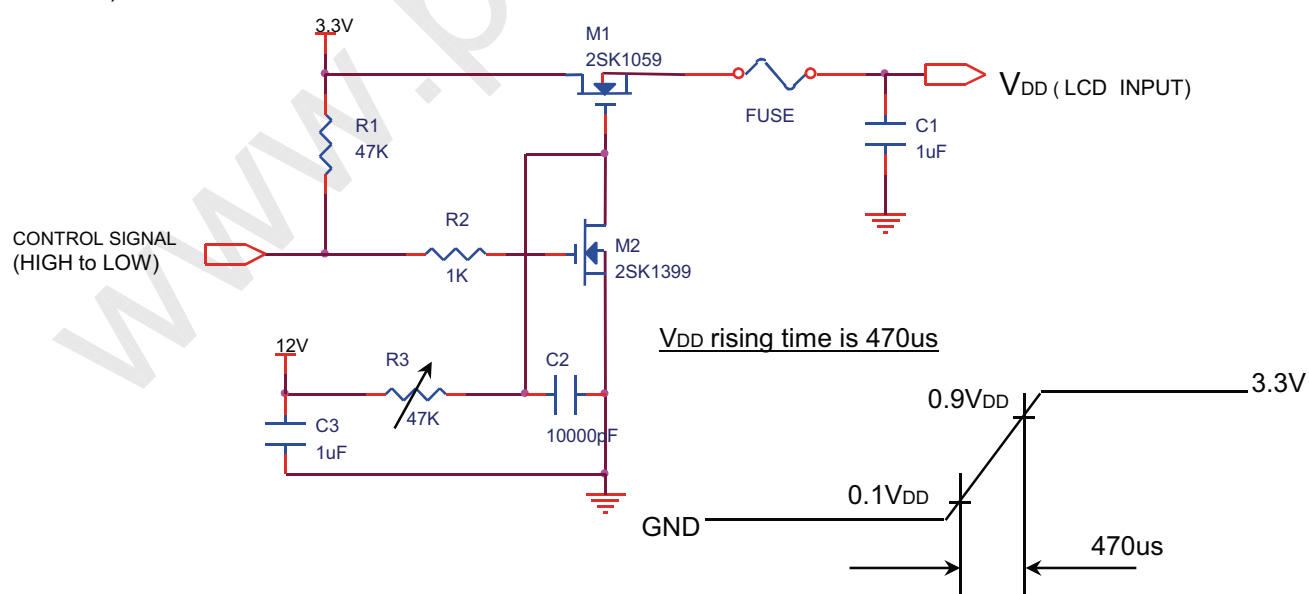
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3.2 BACK-LIGHT UNIT

Ta= 25 ± 2 ℃

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	10,000	-	-	Hr	(1)

Note (1) Life time (Hr) of LEDs can be defined as the time in which it continues to operate under the
condition Ta= 25 ± 2 ℃ and PWM duty = 100% until one of the following event occurs.
- When the brightness becomes 50% or lower than the original.

3.3 LED Driver

- LED Driver Manufacturer : Richtek (RT8561)

Ta= 25 ± 2 ℃

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Input Voltage	V_{BL}	7.0	12	24	V	
V_{LED} on level voltage	V_{LED_on}	7.0	-	24	V	
V_{LED} off level voltage	V_{LED_off}	0	-	2	V	
Input Current	I	-	-	550	mA	
Input Power	Pin	-	-	6.6	W	Pin = VBL x I
PWM duty ratio	-	6	-	100	%	(1)
PWM Frequency	F_{PWM}	0.1	-	30	KHz	(1)
PWM Impedance	Z_{PWM}	2.4	-	-	Mohm	
PWM high level vol.	V_{PWM_H}	1.3	-	5.0	V	
PWM low level vol.	V_{PWM_L}	0	-	0.65	V	
LED_EN Impedance	Z_{LED_EN}	50	-	-	Mohm	
LED_EN high vol.	$V_{LED\_EN\_H}$	1.6	-	5.0	V	
LED_EN low vol.	$V_{LED\_EN\_L}$	0	-	0.5	V	
LED rush current	$I_{LED\ RUSH}$	-	-	1.5	A	

Note - (1) PWM can be guaranteed under the same condition as operation temperate T_{OPR} 0 ~ 50 ℃.

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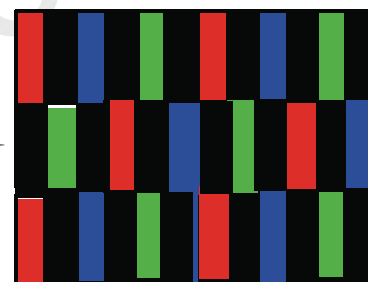| Doc.No.	LTN156AT26-N01	Rev.No	04-A01-S-110715	Page	13 / 34

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4. BLOCK DIAGRAM

4.1 TFT LCD Module

LVDS

| Input Connector |
| I-PEX 20455-040E-12 |

mLVDS

LVDS Input/LCDS Output
Timing Controller

DC-DC
Converter

DC-DC
Converter
VCOM
Generator

Gamma
Generator

Source
Driver
IC

TFT on Glass

15.6" HD
TFT-LCD Panel

→ Video Signal
→ Control Signal
→ VCOM
→ Gamma
→ DVDD
→ AVDD
→ Von/Voff

SOURCE PCB

4.2 LED connection and placement

8 LEDs x 8 channels = Total 64 LEDs

LED Wiring

LED Placement

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5. INPUT TERMINAL PIN ASSIGNMENT

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5.1. Input Signal & Power   LVDS, Connector : IPEX 20455-040E-02R
Mating Connector: IPEX 20454-040T-01

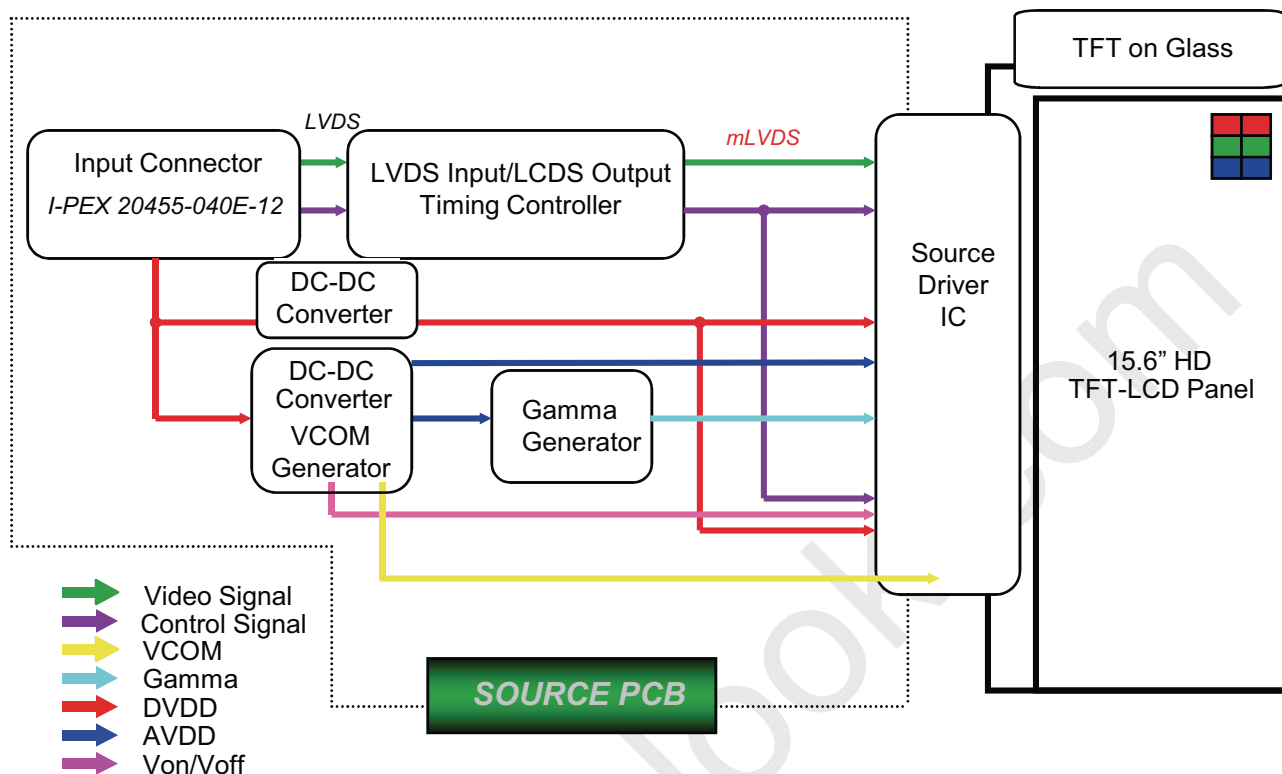| Pin	Symbol	Function
1	NC	No Connection
2	VCC	Power Supply, 3.3V (typical)
3	VCC	Power Supply, 3.3V (typical)
4	VCC_EDID	DDC 3.3V power
5	NC	No Connection
6	CLK_EDID	DDC clock
7	DATA_EDID	DDC data
8	RXin0-	LVDS 0th Signal Negative
9	RXin0+	LVDS 0th Signal Positive
10	GND	Ground
11	RXin1-	LVDS 1st Signal Negative
12	RXn1+	LVDS 1st Signal Positive
13	GND	Ground
14	RXin2-	LVDS 2nd Signal Negative
15	RXn2+	LVDS 2nd Signal Positive
16	GND	Ground
17	ClkIN-	LVDS Clock Signal Negative
18	ClkIN+	LVDS Clock Signal Positive
19	GND	Ground
20~21	NC	No Connection
22	GND	Ground
23~24	NC	No Connection
25	GND	Ground
26~27	NC	No Connection
28	GND	Ground
29~30	NC	No Connection
31~33	GND	Ground
34	NC	No Connection
35	PWM	PWM for luminance control
36	LED_EN	BL On/Off (On : 1.5 ~ 5.0, Off : 0 ~ 0.8V)
37	NC	No Connection
38~40	V_{BL}(7~21)	LED power supply 7V ~ 21V

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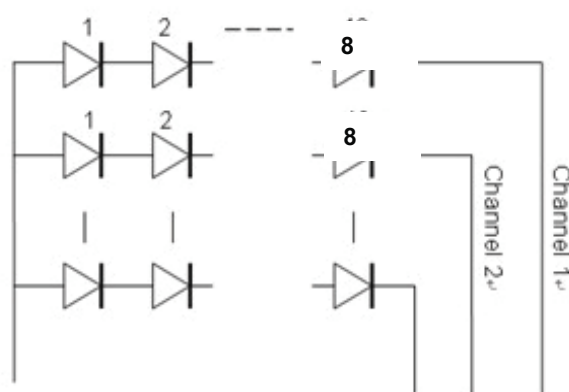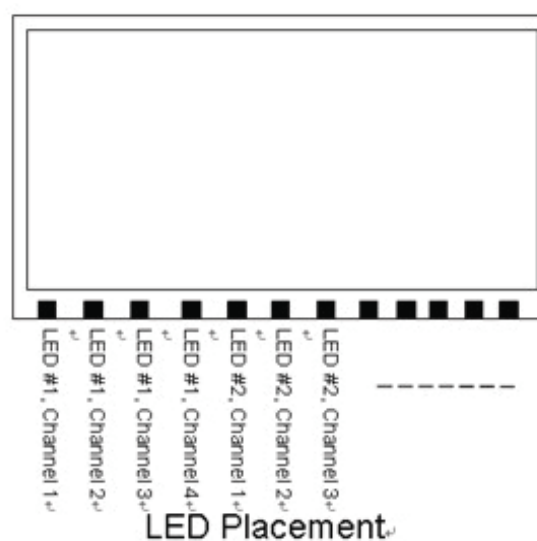| Doc.No.	LTN156AT26-N01	Rev.No	04-A01-S-110715	Page	15 / 34

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5.2 LVDS Interface : Transmitter DS90CF363 or Compatible

Pin No.	Name	RGB Signal	Pin No.	Name	RGB Signal
51	TxIN0	R0	14	TxIN14	G5
52	TxIN1	R1	15	TxIN15	B0
54	TxIN2	R2	19	TxIN18	B1
55	TxIN3	R3	20	TxIN19	B2
56	TxIN4	R4	22	TxIN20	B3
3	TxIN6	R5	23	TxIN21	B4
4	TxIN7	G0	24	TxIN22	B5
6	TxIN8	G1	27	TxIN24	Hsync
7	TxIN9	G2	28	TxIN25	Vsync
11	TxIN12	G3	30	TxIN26	DE
12	TxIN13	G4	31	TxCLKIN	Clock

LVDS INTERFACE
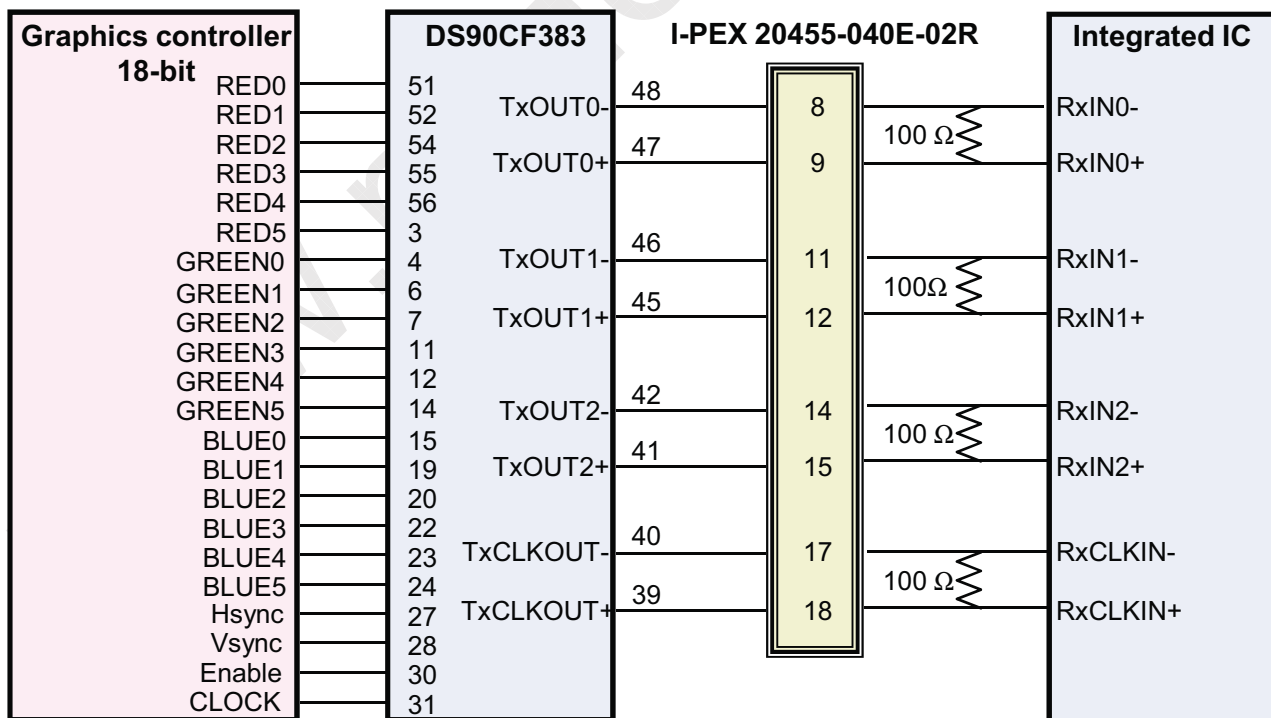
Note : The LCD Module uses a 100ohm resistor between positive and negative lines of each receiver input.

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5.3 LVDS characteristics

LVDS DC Specifications						
Characteristics	**Symbol**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
Differential input high threshold voltage	|VTH|	Vcm = 1.2V	100			mV
Differential input low threshold voltage	|VTL|		100			mV
Differential input voltage	|Vid|		100		600	mV
Common mode voltage	Vcm	|Vid| = 100mV, AVDD33I = 3.3V	0.4	1.2	1.8	V

LVDS AC Specifications						
Characteristics	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks**
ROUTCLK frequency	fRCP	30	72.33	105	MHz	－
TTL data set-up to ROUTCLK	tRS	0.3/fRCP			ns	
TTL data hold from ROUTCLK	tRH	0.3/fRCP			ns	
Skew (Strobe) right margin	TRSRM			500	ps	
Skew (Strobe) left margin	TRSLM			500	ps	
LVDS clock to clock skew margin (Even to odd)	Tskew_eo	-1/7		+1/7	Tclk	－
Unit delay width in skew control block	Δ		100		ps	@NN,55°C,2.5/1.2V

Characteristics	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Remarks**
Modulation Rate	Fmr	-3		3	%	@ MAINCLK = 72.33MHz
Modulation Frequency	Fmf	30		100	Khz	
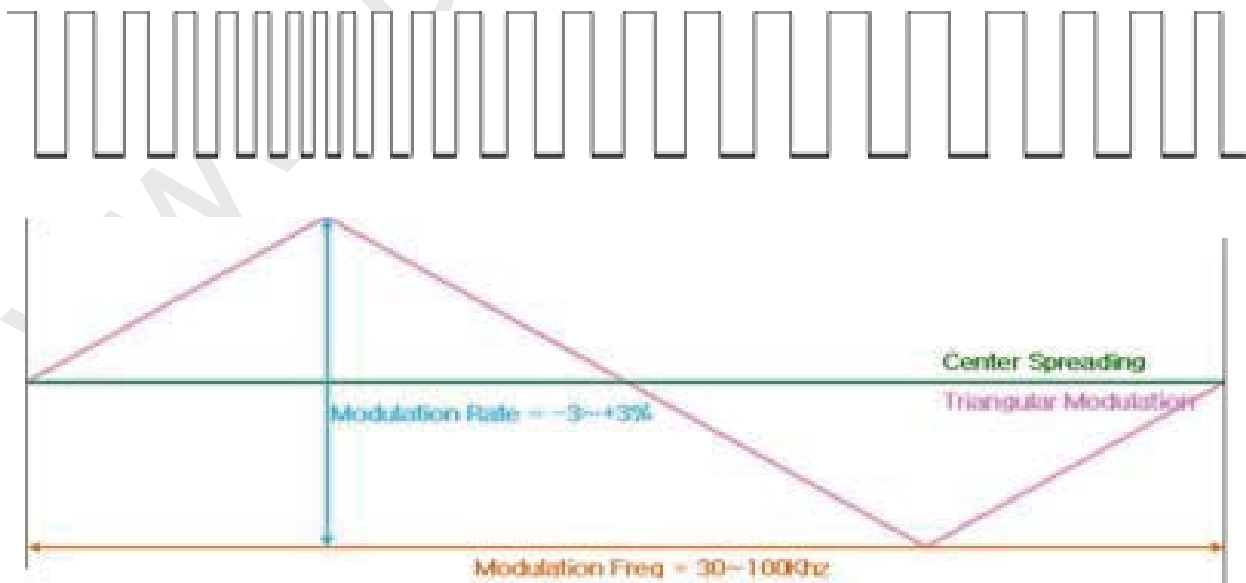
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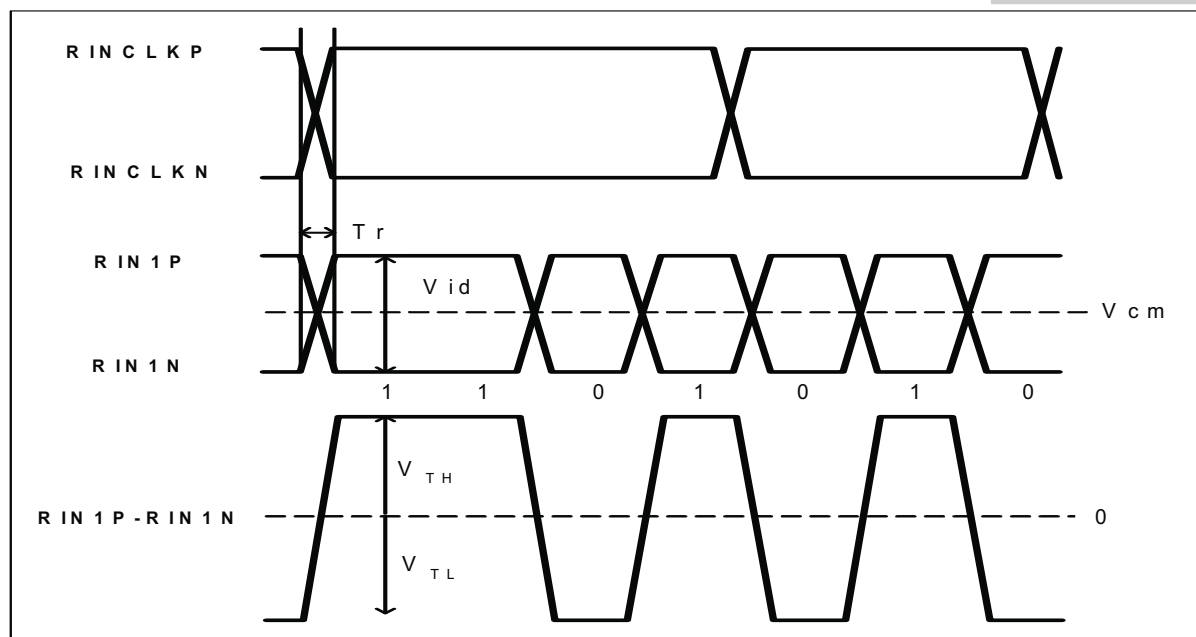
< Definition of LVDS DC characteristics >

< Definition of LVDS AC characteristics >

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5.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

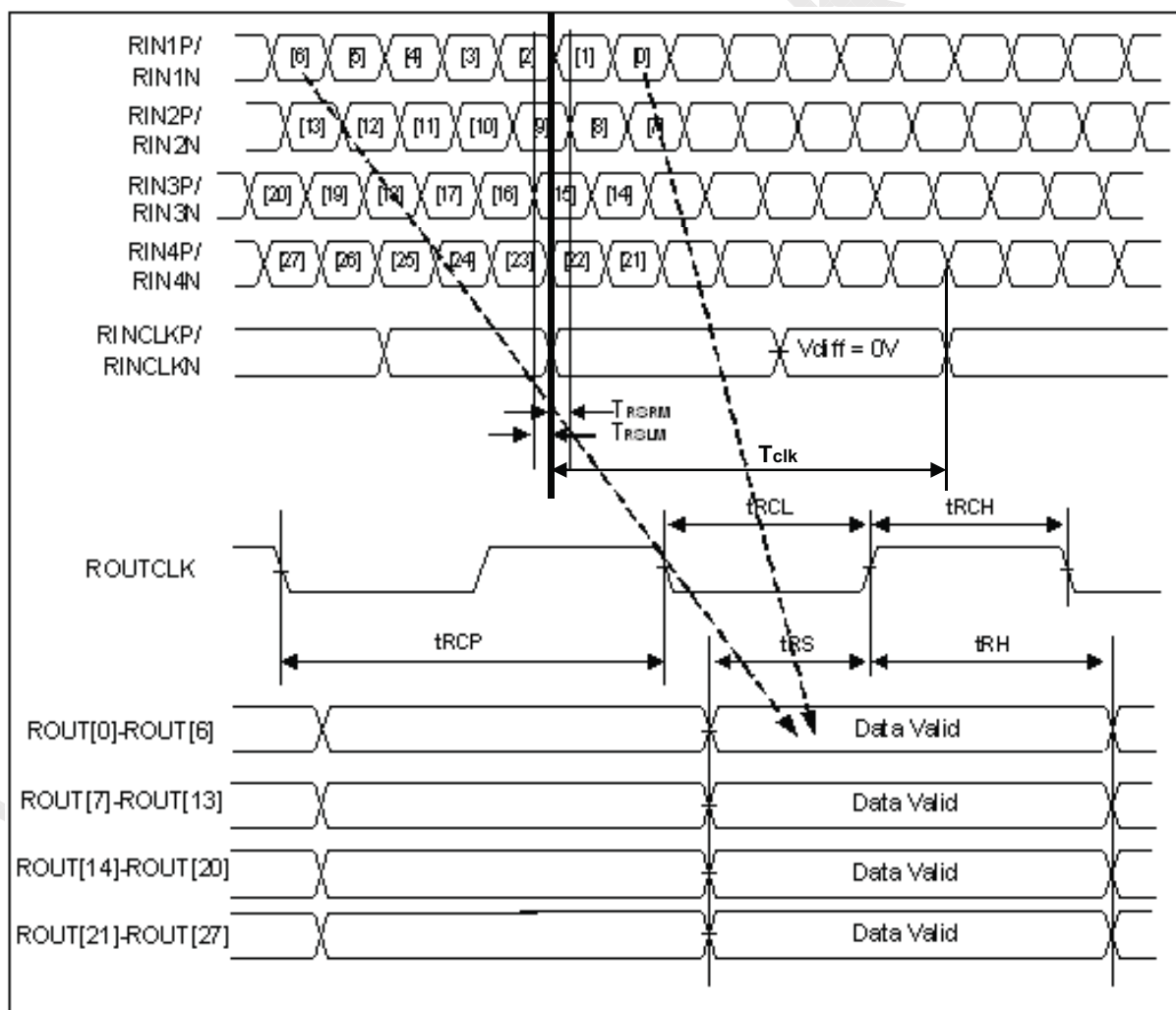| Color	Display	Data Signal																		Gray Scale Level
		Red						Green						Blue						
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	45	B5	
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	-
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	-
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
Gray Scale Of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0
	Dark	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
	↑	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R61
	Light	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R62
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	R63
Gray Scale Of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0
	Dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	G1
	↑	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	G2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	G61
	Light	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	G62
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	G63
Gray Scale Of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0
	Dark	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	B1
	↑	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	B2
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B60
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	↓	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	B61
	Light	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	B62
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B63

Note 1) Definition of gray :
　　Rn: Red gray, Gn: Green gray, Bn: Blue gray (n=gray level)
Note 2)Input signal: 0 =Low level voltage, 1=High level voltage

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5.5 Pixel Format in the display

Pixel 1   Pixel 1366

Line 1   R G B R G B   R G B R G B

LTN156AT26-N

Line 768   R G B R G B   R G B R G B

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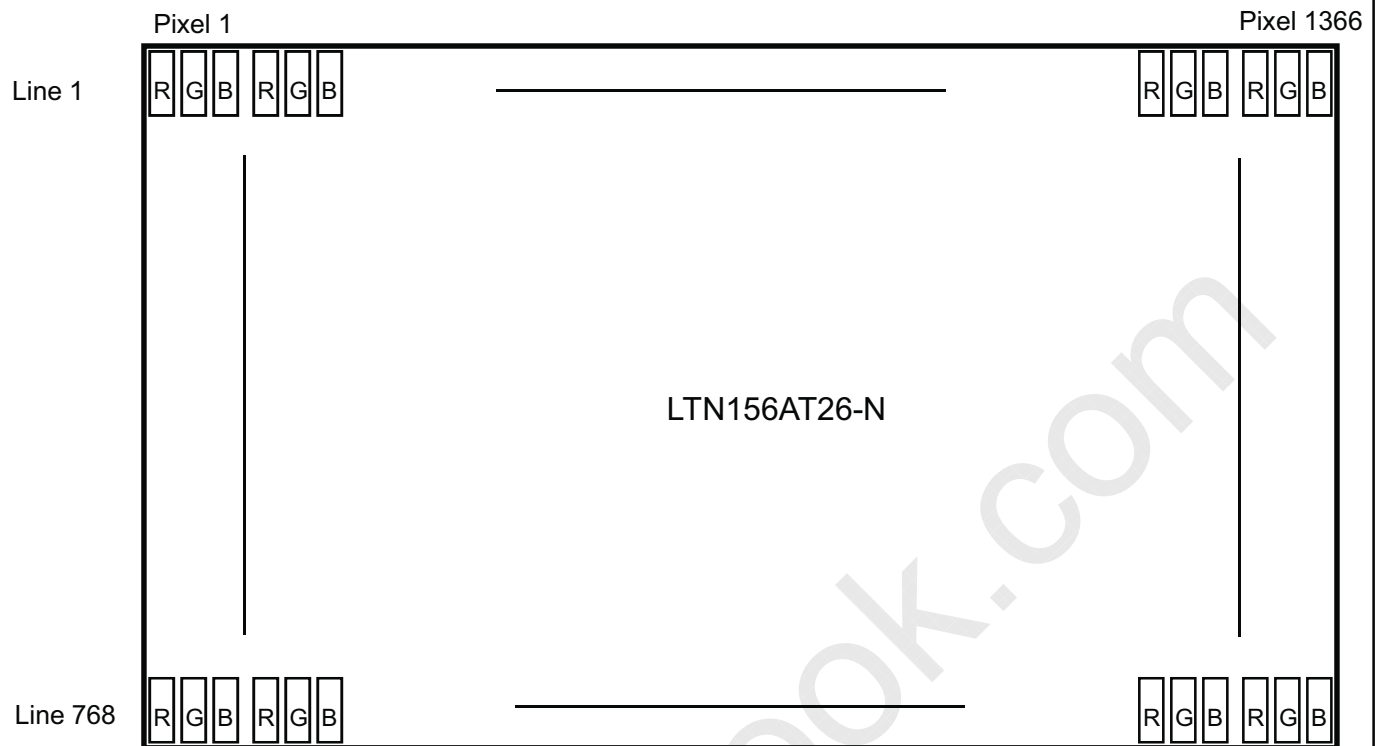
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6. INTERFACE TIMING

6.1 Timing Parameters

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	Cycle	TV	780	790	807	Lines	-
Vertical Active Display Term	Display Period	TVD	-	768	-	Lines	
One Line Scanning Time	Cycle	TH	1430	1526	1620	Clocks	2pixel /clock (1)
Horizontal Active Display Term	Display Period	THD	-	1366	-	Pixels	-

Note 1) DE signal always should have the same cycle during operation.

6.2 Timing diagrams of interface signal
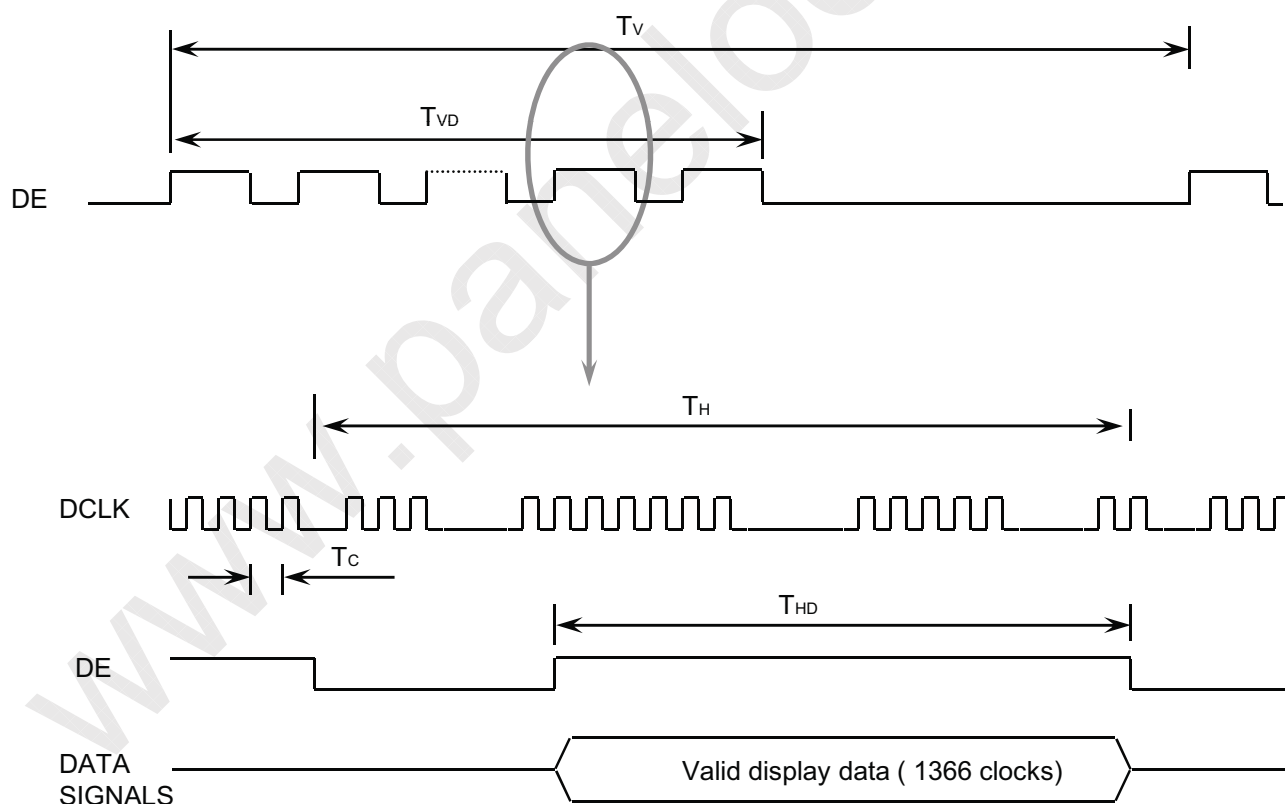
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6.3 Power ON/OFF Sequence

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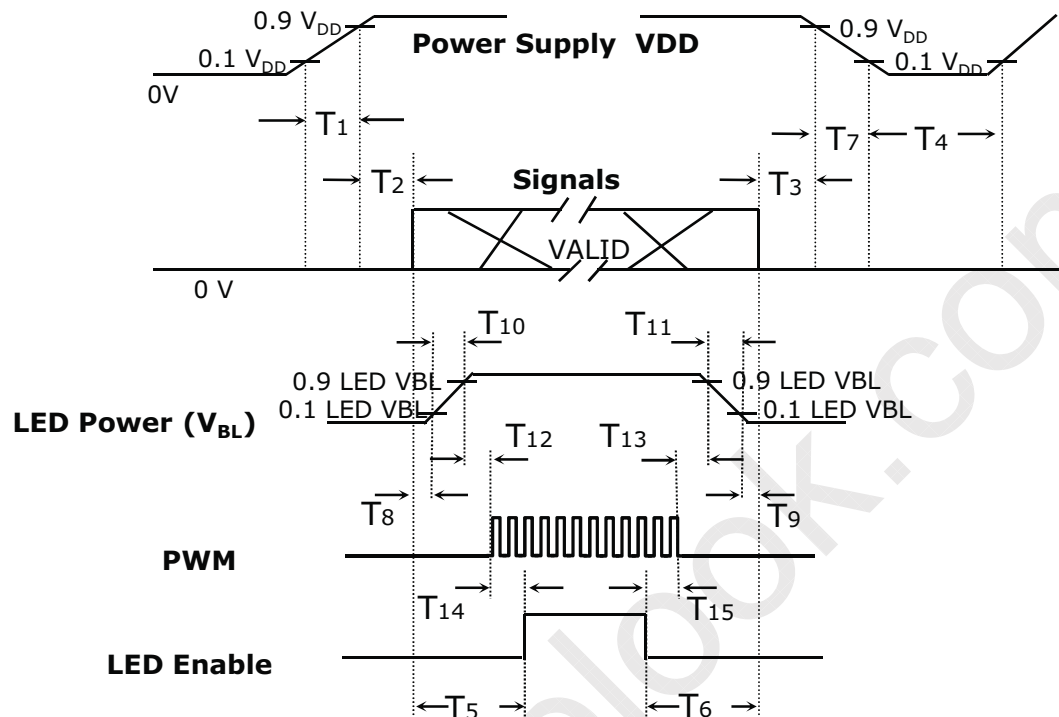: To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.

Power ON/OFF Sequence

Timing (ms)	Remarks
$0 < T_1 \leq 10$	V_{DD} rising time from 10% to 90%
$0 < T_2 \leq 50$	Delay from V_{DD} to valid data at power ON
$0 < T_3 \leq 50$	Delay from valid data OFF to V_{DD} OFF at power Off
$400 \leq T_4$	V_{DD} OFF time
$200 \leq T_5$	Delay from valid data to LED enable at power ON
$200 \leq T_6$	Delay from valid data off to LED disable at power Off
$0 < T_7 \leq 10$	V_{DD} falling time from 90% to 10%
$0 < T_{10} < 10$	LED VBL rising time from 10% to 90%
$0 < T_{11} < 10$	LED VBL falling time from 90% to 10%
$10 < T_{12}$	Delay from LED driver VBL rising time 90% to PWM ON
$10 < T_{13}$	Delay from PWM Off to LED driver VBL falling time 10%
$0 < T_{14}$	Delay from PWM ON to LED Enable ON
$0 < T_{15}$	Delay from B/L Enable Off to PWM Off

Timing Parameters and definition

Note (1) Regarding the timing of T8 and T9, the following one are recommended

10 < T8 : Delay from valid data on to LED driver VBL rising time 10%

10 < T9 : Delay from LED driver VBL falling time 10% to valid data Off

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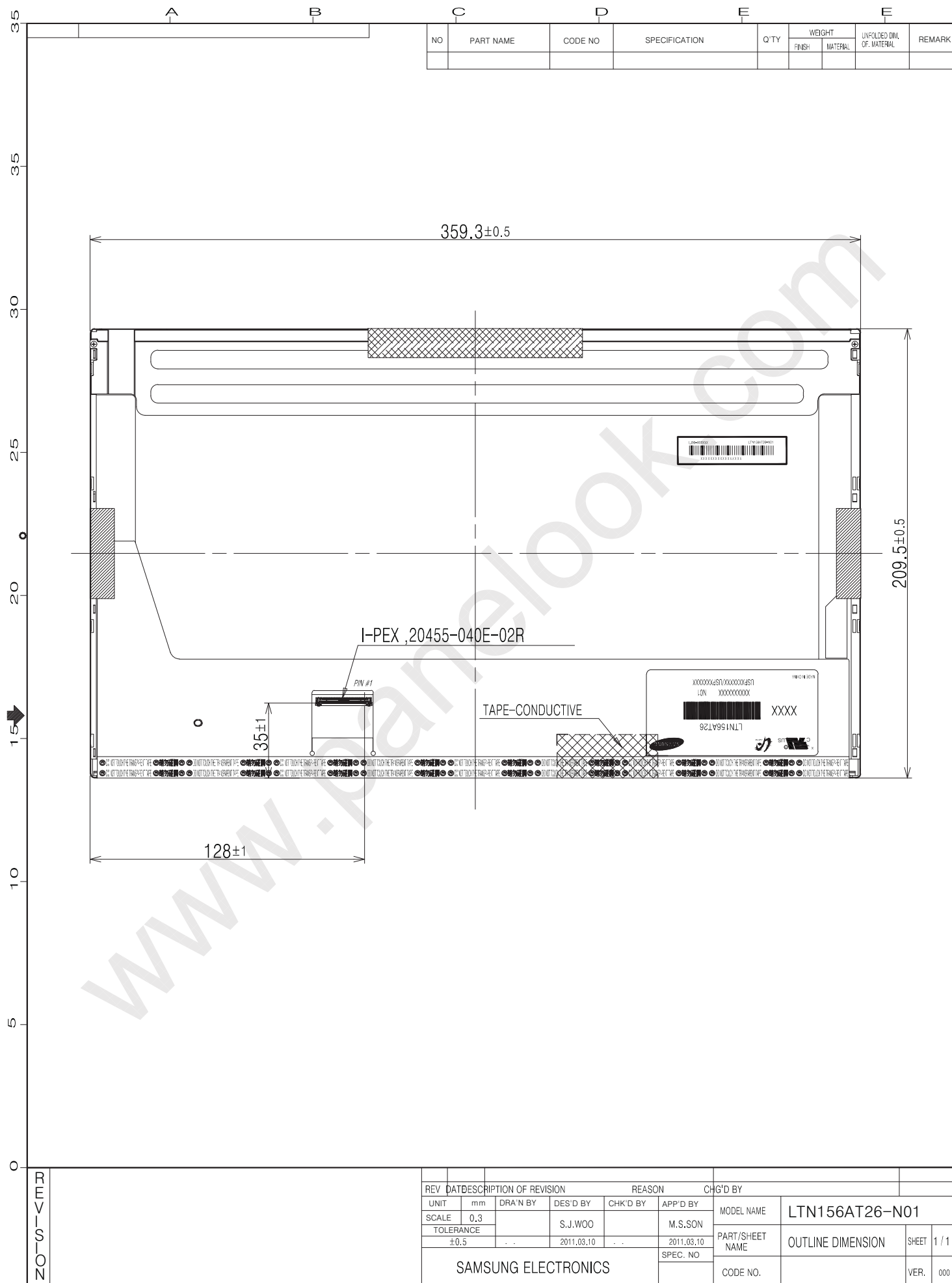| Doc.No.	LTN156AT26-N01	Rev.No	04-A01-S-110715	Page	22 / 34

7. MECHANICAL OUTLINE DIMENSION

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[Refer to the next page]

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NO	PART NAME	CODE NO.	SPECIFICATION	Q'TY	WEIGHT		UNFOLDED DIM. OF. MATERIAL	REMARK
					FINISH	MATERIAL		

5.65 MAX [MODULE THICKNESS]

4-3.1±0.3

8-M2.0, P0.4 TAPPING
DP=2.5MAX SCREW PENETRATION

11.9±0.3

(179.65)

(1.782)　(6.2)

66.9±0.3

4-Ø2

118.8±0.3

(104.75)

185.7±0.3

ACTIVE CENTER

193.536[ACTIVE AREA]

197.1[BEZEL OPENING AREA]

209.5±0.5[OUTLINE]

(2.284)
(7.534)

(1.782)
(7.982)

(2.284)
(7.534)

344.232[ACTIVE AREA]

348.8[BEZEL OPENING AREA]

359.3 ±0.5 [OUTLINE]

5.65 MAX
3.1
SCREW HOLE DEPTH 2.5 Min

BM SHIFT SPEC.
|A-B| < 1.0 (mm)
|C-D| < 1.0 (mm)
|BM| > 1.0 (mm)

C
BM
A　ACTIVE AREA　B
D

* NOTE
1. SIGNAL INTERFACE CONNECTOR TO BE SPECIFIED AS BELOW.
   -. MAKER :I-PEX(Not accecpt compotable connector basically)
   -. INPUT CONNECTOR : I-PEX 20455-040E-02R
2. MAXIMUM SCREW TORQUE : MAX 2.5 Kgf-cm
3. WEIGHT : 490 g MAX
4. In order to avoid IC damage, it is not allow that overlapping
   of cables or antennas, camera , WLAN , WWAN over these COF locations.
5. Chassis Gap : Max 0.7mm
6. This panel is symmetry

REVISION

REV	DATE	DESCRIPTION OF REVISION	REASON	CHG'D BY		
UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY	MODEL NAME	LTN156AT26-N01
SCALE	0.3		S.J.WOO		M.S.SON		
TOLERANCE						PART/SHEET NAME	OUTLINE DIMENSION	SHEET 1/1
±0.5		. .	2011.03.10	. .	2011.03.10			
						SPEC. NO		
SAMSUNG ELECTRONICS						CODE NO.		VER. 000

NO	PART NAME	CODE NO	SPECIFICATION	Q'TY	WEIGHT		UNFOLDED DIM. OF. MATERIAL	REMARK
					FINISH	MATERIAL		

359.3±0.5

209.5±0.5

I-PEX ,20455-040E-02R

PIN #1

35±1

TAPE-CONDUCTIVE

LTN156AT26

N01
XXXXXXXXXXX
USPXXXXXX/USPXXXXXXX

XXXX

128±1

REVISION	REV	DATE	DESCRIPTION OF REVISION	REASON	CHG'D BY			
	UNIT	mm	DRA'N BY	DES'D BY	CHK'D BY	APP'D BY	MODEL NAME	LTN156AT26-N01
	SCALE	0.3		S.J.WOO		M.S.SON		
	TOLERANCE		. .	2011.03.10	. .	2011.03.10	PART/SHEET NAME	OUTLINE DIMENSION
	±0.5						SPEC. NO	
	SAMSUNG ELECTRONICS						CODE NO.	

SHEET 1 / 1
VER. 000

8. PACKING

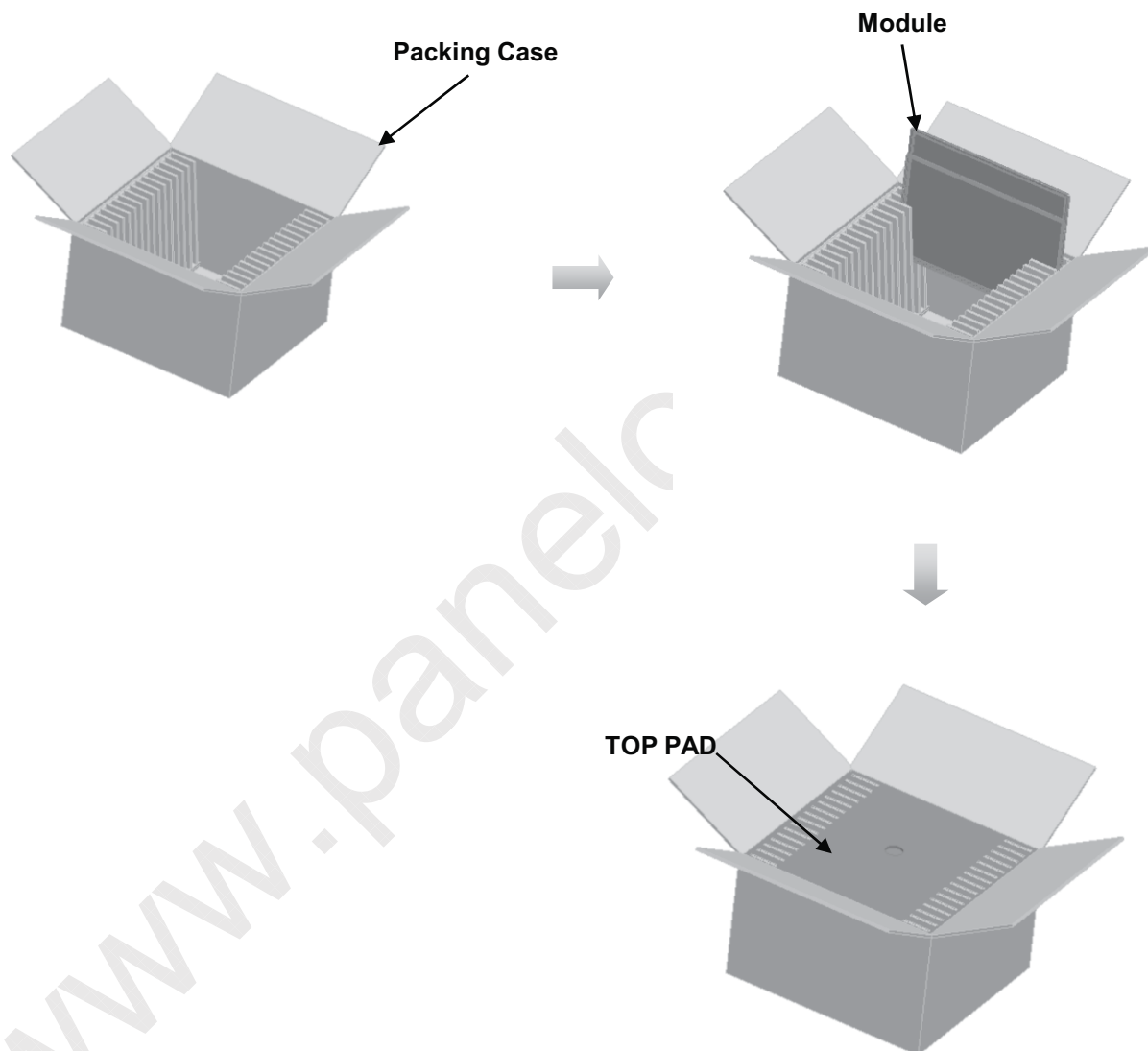Approval

1. CARTON(Internal Package)

 (1) Packing Form
　　 Corrugated Cardboard

 (2) Packing Method
　　 All 22pcs panels have each "Static electric protective sack" (22pcs)
　　 (Two panels are in 1 partition.)

Packing Case

Module

TOP PAD

Note 1) Total Weight : Approximately 12.5 kg

2) Acceptance number of piling : 22 sets

3) Carton size : 283(W) x 401(D) x 246 (H)

4) 12ea Silica-gel packs are included in the box

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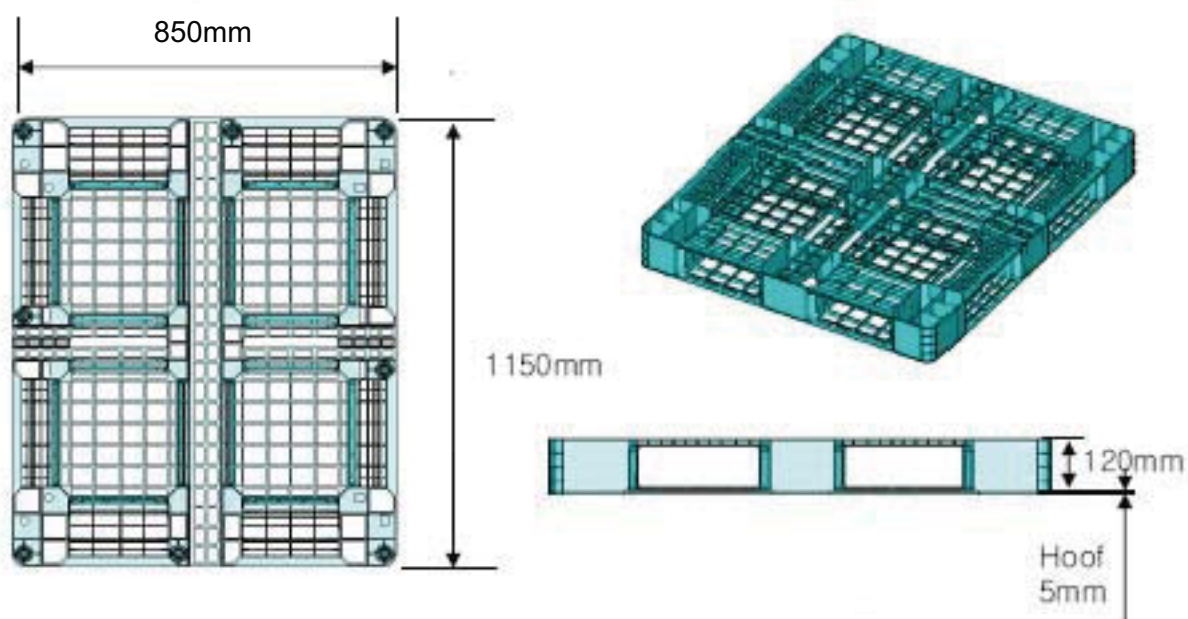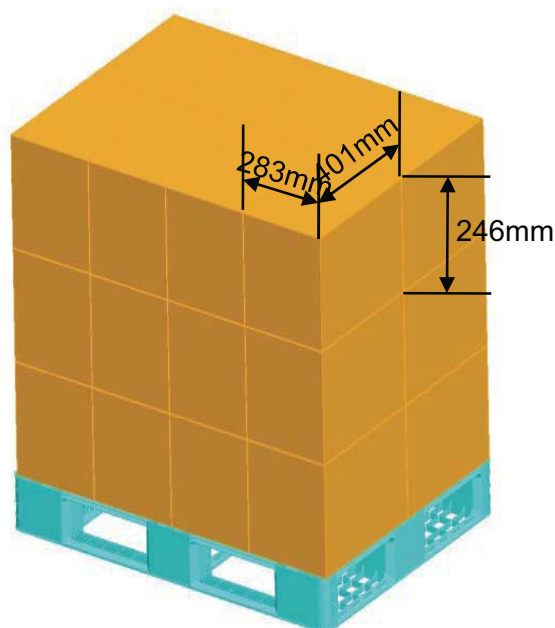| Doc.No.	LTN156AT26-N01	Rev.No	04-A01-S-110715	Page	26 / 34

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(3)Packing Material

No	Part name	Quantity
1	Static electric protective sack	22
2	Pictorial marking	2 pcs
3	Carton	1 set

(4)Pallet Form

850mm

1150mm

120mm

Hoof 5mm

283mm / 401mm

246mm

Note 1) Total : 24 boxes

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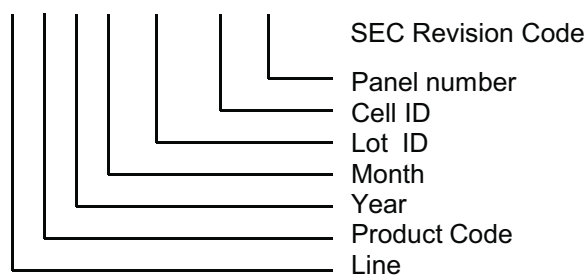| **Doc.No.**	LTN156AT26-N01	**Rev.No**	04-A01-S-110715	**Page**	27 / 34

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9. MARKINGS & OTHERS

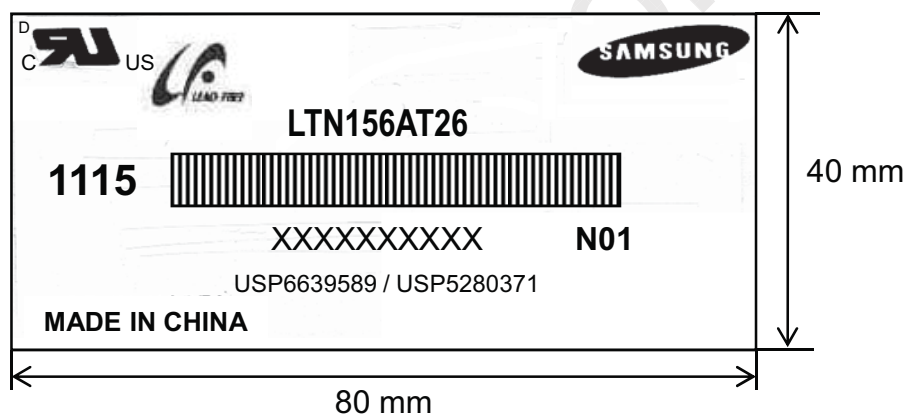A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

(1)Parts number : LTN156AT26-N01
(2)Revision code : 3 letters
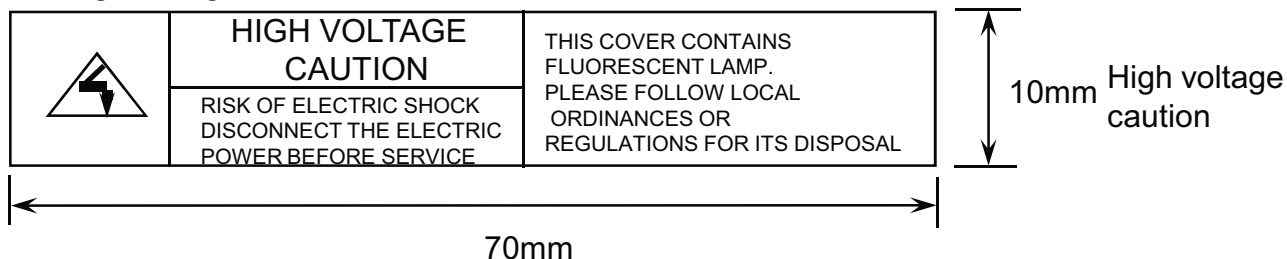(3)Lot number   : X X X X   XX XX XX   N01

- SEC Revision Code
- Panel number
- Cell ID
- Lot ID
- Month
- Year
- Product Code
- Line

(4) Nameplate Indication

LTN156AT26	
1115 ||||||||||||||||||||||||	SAMSUNG
XXXXXXXXXX N01	40 mm
USP6639589 / USP5280371	
MADE IN CHINA	

80 mm

Parts name   : LTN156AT26
Lot number   : XXXXXXXXXX
Inspected work week   : 1115 (2011 year 15th week)
Product Revision Code : N01
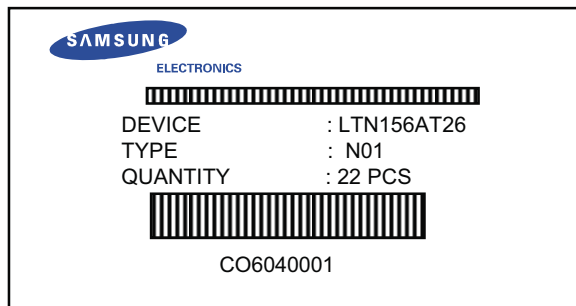US Patents No.   : USP6639589 / USP5280371

High voltage caution label

	HIGH VOLTAGE CAUTION	THIS COVER CONTAINS FLUORESCENT LAMP. PLEASE FOLLOW LOCAL ORDINANCES OR REGULATIONS FOR ITS DISPOSAL	
⚡	RISK OF ELECTRIC SHOCK DISCONNECT THE ELECTRIC POWER BEFORE SERVICE		10mm High voltage caution

70mm

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(5)　Packing small box attach

SAMSUNG
ELECTRONICS

DEVICE　　　　　: LTN156AT26
TYPE　　　　　　:　N01
QUANTITY　　　　: 22 PCS

CO6040001

Samsung Secret

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10. GENERAL PRECAUTIONS

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1. Handling

  (a) When the module is assembled, It should be attached to the system firmly
     using every mounting holes. Be careful not to twist and bend the modules.

  (b) Refrain from strong mechanical shock and / or any force to the module. In addition to
     damage, this may cause improper operation or damage to the module and CCFT back-light.

  (c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch
     the surface harder than a HB pencil lead.

  (d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time,
     Staining and discoloration may occur.

  (e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

  (f) The desirable cleaners are water, IPA (Isoprophyl Alcohol) or Hexane.
     Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl
     chloride. It might permanent damage to the polarizer due to chemical reaction.

  (g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or
     mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly
     with soap.

  (h) Protect the module from static , it may cause damage to the C-MOS Gate Array IC.

  (i) Use fingerstalls with soft gloves in order to keep display clean during the incoming
     inspection and assembly process.

  (j) Do not disassemble the module.

  (k) Do not pull or fold the lamp wire.

  (l) Do not adjust the variable resistor which is located on the back side.

  (m) Protection film for polarizer on the module shall be slowly peeled off just before use so
     that the electrostatic charge can be minimized.

  (n) Pins of I/F connector shall not be touched directly with bare hands.

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2. STORAGE

  (a) Do not leave the module in high temperature, and high humidity for a long time.
     It is highly recommended to store the module with temperature from 5 to 40 °C and
     relative humidity of less than 70%.

  (b) Do not store the TFT-LCD module in direct sunlight.

  (c) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent
     light during the store.

  (d) Storage period is recommended not to exceed 1 year.

3. OPERATION

  (a) Do not connect,disconnect the module in the " Power On" condition.

  (b) Power supply should always be turned on/off by following item 6.3
     " Power on/off sequence ".

  (c) Module has high frequency circuits. Sufficient suppression to the electromagnetic
     interference shall be done by system manufacturers. Grounding and shielding methods
     may be important to minimize the interference.

  (d) The cable between the back-light connector and its inverter power supply shall be a
     minimized length and be connected directly . The longer cable between the back-light
     and the inverter may cause lower luminance of lamp(CCFT) and may require higher
     startup voltage (Vs).

  (e) The standard limited warranty is only applicable when the module is used for general
     notebook applications. If used for purposes other than as specified, SEC is not to be
     held reliable for the defective operations. It is strongly recommended to contact SEC
     to find out fitness for a particular purpose.

  (f) When you connect a signal cable to LCD, remove an AC adapter by all means.
     In addition, to connect with keep the correct sequence, not to occur the short by left
     voltage.

4. OTHERS

  (a) Ultra-violet ray filter is necessary for outdoor operation.

  (b) Avoid condensation of water. It may result in improper operation or disconnection
     of electrode.

  (c) Do not exceed the absolute maximum rating value. (the supply voltage variation, input
     voltage variation, variation in part contents and environmental temperature, so on)
     Otherwise the module may be damaged.

  (d) If the module displays the same pattern continuously for a long period of time,it can be
     the situation when the image "sticks" to the screen.

  (e) This module has its circuitry PCB's on the rear side and should be handled carefully in
     order not to be stressed.

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11. EDID

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Address (HEX)	FUNCTION	Value HEX	BIN	DEC	ASCII or Data	Notes
00	Header	00	00000000	0		EDID Header
01		FF	11111111	255		
02		FF	11111111	255		
03		FF	11111111	255		
04		FF	11111111	255		
05		FF	11111111	255		
06		FF	11111111	255		
07		00	00000000	0		
08	ID Manufacturer Name	4C	01001100	76	S E C	3 character ID
09		A3	10100011	163		"SEC"
0A	ID Product Code	47	01000111	71	[G]	
0B		36	00110110	54	[6]	
0C	32-bit serial no.	00	00000000	0		
0D		00	00000000	0		
0E		00	00000000	0		
0F		00	00000000	0		
10	Week of manufacture	00	00000000	0		
11	Year of manufacture	14	00010100	20	2010	2010
12	EDID Structure Ver.	01	00000001	1	1	EDID Ver. 1.0
13	EDID revision #	03	00000011	3	3	EDID Rev. 3
14	Video input definition	80	10000000	128		
15	Max H image size	22	00100010	34	34	34 cm(approx)
16	Max V image size	13	00010011	19	19	19 cm(approx)
17	Display Gamma	78	01111000	120	2.2	Gamma 2.2
18	Feature support	0A	00001010	10		
19	Red/green low bits	89	10001001	137		10000111
1A	Blue/white low bits	A5	10100101	165		11111110
1B	Red x/ high bits	9D	10011101	157	0.615	Red x 0.615= 10011101
1C	Red y	5B	01011011	91	0.355	Red y 0.355= 01011000
1D	Green x	54	01010100	84	0.330	Green x 0.330= 01010100
1E	Green y	9C	10011100	156	0.610	Green y 0.610= 10011100
1F	Blue x	26	00100110	38	0.150	Blue x 0.150= 00100110
20	Blue y	19	00011001	25	0.100	Blue y 0.100= 00011001
21	White x	50	01010000	80	0.313	White x 0.313= 01010000
22	White y	54	01010100	84	0.329	White y 0.329= 01010100
23	Established timing 1	00	00000000	0		
24	Established timing 2	00	00000000	0		
25	Established timing 3	00	00000000	0		
26	Standard timing #1	01	00000001	1		not used
27		01	00000001	1		
28	Standard timing #2	01	00000001	1		not used
29		01	00000001	1		
2A	Standard timing #3	01	00000001	1		not used
2B		01	00000001	1		
2C	Standard timing #4	01	00000001	1		not used
2D		01	00000001	1		
2E	Standard timing #5	01	00000001	1		not used
2F		01	00000001	1		
30	Standard timing #6	01	00000001	1		not used
31		01	00000001	1		
32	Standard timing #7	01	00000001	1		not used
33		01	00000001	1		
34	Standard timing #8	01	00000001	1		not used
35		01	00000001	1		

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36		41	01000001	65	72.33	Main clock= 72.33 MHz
37		1C	00011100	28		
38		56	01010110	86	1366	Hor active=1366 pixels
39		A0	10100000	160	160	Hor blanking=160 pixels
3A		50	01010000	80		4bit : 4bit
3B		00	00000000	0	768	Vertcal active=768 lines
3C		16	00010110	22	22	Vertical blanking=22 lines
3D		30	00110000	48		4bit : 4bit
3E		30	00110000	48	48	
3F	Detailed timing/monitor descriptor #1	20	00100000	32	32	H sync. Width=32 pixels
40		25	00100101	37	2	V sync. Offset=2 lines
					5	V sync. Width=5 lines
41		00	00000000	0		2bit : 2bit :2bit :2bit
42		58	01011000	88	344	H image size= 344 mm(approx)
43		C1	11000001	193	193	V image size = 193 mm(approx)
44		10	00010000	16		
45		00	00000000	0		No Horizontal Border
46		00	00000000	0		No Vertical Border
47		19	00011001	25		
48		00	00000000	0		
49		00	00000000	0		
4A		00	00000000	0		Manufacturer Specified (Timing)
4B		0F	00001111	15		
4C		00	00000000	0		
4D		00	00000000	0		Value=HSPWmin / 2
4E		00	00000000	0		Value=HSPWmax / 2
4F	Detailed timing/monitor descriptor #2	00	00000000	0		Value=Thbpmin /2
50		00	00000000	0		Value=Thbpmax /2
51		00	00000000	0		Value=VSPWmin /2
52		00	00000000	0		Value=VSPWmax /2
53		00	00000000	0		Value=Tvbpmin / 2
54		00	00000000	0		Value=Tvbpmax / 2
55		1E	00011110	30		Thpmin=value*2 + HA pixelclks
56		B4	10110100	180		Thpmax=value*2 + HA pixelclks
57		02	00000010	2		Tvpmin=value*2 + VA lines
58		74	01110100	116		Tvpmax=value*2 + VA lines
59		00	00000000	0		Module revision
5A		00	00000000	0		
5B		00	00000000	0		
5C		00	00000000	0		ASCII Data String Tag
5D		FE	11111110	254		
5E		00	00000000	0		
5F		53	01010011	83	[S]	
60		41	01000001	65	[A]	
61	Detailed timing/monitor descriptor #3	4D	01001101	77	[M]	
62		53	01010011	83	[S]	
63		55	01010101	85	[U]	
64		4E	01001110	78	[N]	
65		47	01000111	71	[G]	
66		0A	00001010	10	[^]	
67		20	00100000	32	[ ]	
68		20	00100000	32	[ ]	
69		20	00100000	32	[ ]	
6A		20	00100000	32	[ ]	
6B		20	00100000	32	[ ]	

Samsung Secret

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6C		00	00000000	0		Monitor Name Tag (ASCII)
6D		00	00000000	0		
6E		00	00000000	0		
6F		FE	11111110	254		
70		00	00000000	0		
71		31	00110001	49	[1]	
72		35	00110101	53	[5]	
73	Detailed timing/monitor	36	00110110	54	[6]	
74	descriptor #4	41	01000001	65	[A]	
75		54	01010100	84	[T]	
76		32	00110010	50	[2]	
77		36	00110110	54	[6]	
78		2D	00101101	45	[-]	
79		4E	01001110	78	[N]	
7A		30	00110000	48	[0]	
7B		31	00110001	49	[1]	
7C		0A	00001010	10	[^]	
7D		20	00100000	32	[]	
7E	Extension Flag	00	00000000	0		
7F	Checksum	E8	11101000	232		

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